CLAIMS:

1. (Amended) A wheel-state obtaining apparatus comprising:

a wheel-side device (10-16; 10b-16b; 200-206; 300-306; 400a-400d; 500) provided for each of at least one of a plurality of wheels (FR, FL, RR, RL) of a vehicle and including a first-wheel-state detecting device (32; 212: 312; 412; 504) operable to detect a first state of the corresponding wheel; and

a body-side device (18; 18b; 230; 330; 404; 520) disposed on a body of the vehicle and including (a) a detected-information obtaining device (52; 252; 352: 424; 512) operable to obtain detected information representative of the first state of said corresponding wheel detected by said first-wheel-state detecting device, (b) a vehicle-state detecting device (60-66; 360-364; 420; 516) operable to detect a state of the vehicle, (c) an estimated-information obtaining device (54; 254; 354; 426; 518) operable to estimate said first state of said corresponding wheel on the basis of at least the state of the vehicle detected by said vehicle-state detecting device, and obtain estimated information representative of the estimated first state, and (d) a determining device (55; 255; 355; 428; 522) operable to determine one of said detected information and said estimated information, as wheel-state information representative of said first state of said corresponding wheel,

and wherein said estimated-information obtaining device (54; 254; 354; 426; 518) is operable to obtain said estimated information, during a period between adjacent moments of reception by said body-side device of wheel-side information representative of said first state of said corresponding wheel detected by said first-wheel-state detecting device, said determining device including a first determining portion operable to determine, as said wheel-state information, said estimated information obtained during said period.

2. A wheel-state obtaining apparatus according to claim 1, wherein said determining device includes an individually determining portion operable for each of said plurality of wheels,

independently of each other, such that one of said detected information and said estimated information is determined as said wheel-state information for each of said plurality of wheels.

3. A wheel-state obtaining apparatus according to claim 1, wherein said determining device includes an overall determining portion operable for all of said plurality of wheels, such that one of said detected information and said estimated information is determined as said wheel-state information, commonly for all of

said plurality of wheels.

4. A wheel-state obtaining apparatus according to any one of claims 1-3, wherein said determining device includes a detection-failure estimated-information obtaining portion (55; 355; 428; 522) operable to determine said detected information as said wheel-state information when said first state of said corresponding wheel has been detected by said first-wheel-state detecting device (32; 312; 412; 516), and determine said estimated information as said wheel-state information when said first state has not been detected by said first-wheel-state detecting device.

5. (Amended) A wheel-state obtaining apparatus according to any one of claims 1-4, wherein said wheel-side device further includes (a) a wheel-side-information transmitting device (36; 36b; 216; 316: 416; 506) operable to transmit, in a wireless fashion, said wheel-side information, and (b) an electric power source (38; 218; 318; 418) operable to supply said wheel-side-information transmitting device and said first-wheel-state detecting device with an electric energy, and said body-side device further includes a receiving device (20-26: 20b-26b; 240-246; 332-338; 419a-419d; 510) operable to receive said wheel-side information transmitted from said wheel-side device, said detected-information obtaining device including a detected-information extracting portion (52; 252; 352; 424; 512) operable to extract from said wheel-side information said detected information representative of the first state of said corresponding wheel.

6. A wheel-state obtaining apparatus according to claim 5, wherein said determining device includes a reception-condition-dependent determining portion operable to determine one of said detected information and said estimated information as said wheel-state information, on the basis of a condition of reception of said wheel-side information by said

receiving device.

7. (Amended) A wheel-state obtaining apparatus according to claim 5 or 6, wherein said determining device further includes a second determining portion operable to determine said estimated information as said wheel-state information when said wheel-side information has not been normally received by said receiving device, due to at least one of an abnormality of said wheel-side device, an abnormality of said receiving device, and a noise included in said wheel-side information, and determine said detected information as said wheel-state information when said wheel-side information has been normally received by said receiving device.

8. A wheel-state obtaining apparatus according to claim 7, wherein said determining portion determines said estimated information as said wheel-state information when said wheel-side information received by said receiving device is abnormal, and determines said estimated information as said wheel-state information when said wheel-state information received by said receiving device is normal.

9. A wheel-state obtaining apparatus according to any one of claims 5-8, wherein said determining device includes a reception-failure estimated-information determining portion (55; 355; 428; 522) operable to determine said estimated information as said wheel-state information when said wheel-side information has not been received by said receiving device, at a predetermined timing of reception of said wheel-side information by said receiving device.

10. A wheel-state obtaining apparatus according to claim 9, wherein said wheel-side-information transmitting device includes a periodically transmitting portion (36; 316; 416; 506) operable to transmit said wheel-side information at a predetermined interval of transmission.

11. A wheel-state obtaining apparatus according to any one of claims 5-10, wherein said wheel-side-information transmitting device includes a periodically transmitting portion (36; 36b; 216;

316; 416; 506) operable to transmit said wheel-side information at a predetermined interval of transmission, and said estimated-information obtaining device (54; 254; 354; 426; 518) is operable to obtain said estimated information during a predetermined interval of reception of said wheel-side information by said receiving device (20-26; 20b-26b; 240-246; 332-338: 419a-419d; 510).

12. A wheel-state obtaining apparatus according to any one of claims 5-11, wherein said determining device (55) includes a reception-condition determining portion operable to determine whether a ratio of reception of said wheel-side information by said receiving device (20b-26b) is relatively high or low, and a reception-condition-dependent determining portion operable to determine said detected information as said wheel-state information when said reception-condition determining portion determines that said ratio of reception is relatively high, and determine said estimated information as said wheel-state information when said reception-condition determining portion determines that said ratio of reception is relatively low.

13. A wheel-state obtaining apparatus according to any one of claims 1-12, wherein said vehicle-state detecting device includes a second-wheel-state detecting device (60-66; 360-364; 420; 516) operable to detect a second state of each of at least one of said plurality of wheels, said second state being different from said first state.

14. (Amended) A wheel-state obtaining apparatus according to any one of claims 5-13, wherein said estimated-information obtaining device includes a detected-state estimating portion (54; 354; 426; 518) operable to estimate said first state of said corresponding wheel after last reception of said wheel-side information by said receiving device (20-26; 332-338; 419a-419d; 510), on the basis of at least said first state of said corresponding wheel represented by the wheel-side information received last by said receiving device.

15. A wheel-state obtaining apparatus according to claim 14,

information as said wheel-state information, on the basis of the running state of the vehicle detected by said vehicle-running-state detecting portion.

26. A wheel-state obtaining apparatus according to any one of claims 1-2, wherein said determining device includes (a) a roadway-surface detecting portion (60-66) operable to detect a condition of a roadway surface on which the vehicle is running, and (b) a roadway-condition-dependent determining portion (S154) operable to determine one of said detected information and said estimated information as said wheel-state information, on the basis of the condition of said roadway surface detected by said roadway-surface detecting portion.

27. (Amended) A wheel-state obtaining apparatus according to any one of claims 1-26, wherein said determining device further includes a third determining portion (S201-S203) operable to determine said estimated information as said wheel-state information, when a state of change of said estimated information as obtained by said estimated-information obtaining device is smaller than a predetermined state.

28. (Amended) A wheel-state obtaining apparatus according to any one of claims 1-27, wherein said determining device includes an independently determining portion (S154-S156; S202; S251-S252) operable to determine one of said detected information and said estimated information as said wheel-state information representative of said first state of each of said plurality of wheels, such that said detected information is selected as said wheel-state information of at least one of said plurality of wheels, while said estimated information is selected as said wheel-state information of the other of said plurality of wheels.

29. A wheel-state obtaining apparatus according to any one of claims 5-28, wherein said wheel-side device further includes a transmission control device (75) operable to control a state of

ambient temperature and running state of the vehicle, to obtain estimated-temperature-state information representative of the estimated state of the temperature.

38. A wheel-state obtaining apparatus according to any one of claims 1-37, wherein said first-wheel-state detecting device includes a force-detecting device (312; 412) operable to detect at least one force acting on each of at least one of said plurality of wheels, and said vehicle-state detecting device includes at least one of (a) a driving-state detecting device (360) operable to detect a driving state of the vehicle, (b) a braking-state detecting device (372) operable to detect a braking state of the vehicle, and (c) a turning-state detecting device (364) operable to detect a turning state of the vehicle, said estimated-information obtaining device including an estimated-force-information obtaining portion (354; 426) operable to estimate said at least one force acting on each of said at least one of the plurality of wheels on the basis of at least one of the detected accelerating, braking and turning states of the vehicle, to obtain estimated-force information representative of the estimated at least one force.

39. (Amended) A wheel-state obtaining apparatus comprising:

a wheel-side device (10-16; 10b-16b; 200-206; 300-306; 400a-400d; 500) provided for each of at least one of a plurality of wheels (FR, FL, RR, RL) of a vehicle and including (a) a first-wheel-state detecting device (32; 212; 312; 412; 504) operable to detect a first state of the corresponding wheel, and (b) a wheel-side-information transmitting device (36; 36b; 216; 316; 416; 506) operable to transmit, in a wireless fashion, wheel-side information representative of said first state of said corresponding wheel detected by said first-wheel-state detecting device; and

a body-side device (18; 18b; 230; 330; 404; 520) disposed on a body of the vehicle and including (c) a receiving device (20-26; 20b-26b; 240-246; 332-338; 419a-419d; 510) operable to receive said wheel-side information transmitted from said wheel-side device, (d) a detected-information obtaining device (52; 252; 352;

424; 512) operable to obtain received-information representative of the first state of said corresponding wheel, from said wheel-side information received by said receiving device, (e) a vehicle-state detecting device (60-66; 360-364; 420; 516) operable to detect a state of the vehicle, (f) an estimated-information obtaining device (54; 254; 354; 426; 518) operable to estimate said first sate of said corresponding wheel, on the basis of at least the state of the vehicle detected by said vehicle-state detecting device, and obtain estimated information representative of the estimated first state, and (g) an obtaining-device selecting portion (55; 255; 355; 428; 522) operable to select one of said estimated-information obtaining device and said detected-information obtaining device,

and wherein said estimated-information obtaining device (54; 254; 354; 426; 518) is operable to obtain said estimated information, during a period between adjacent moments of reception by said receiving device of wheel-side information representative of said first state of said corresponding wheel detected by said first-wheel-state detecting device, said obtaining-device selecting portion being operable to select said estimated-information obtaining device during said period.

40. (Canceled)

41. (Amended) A vehicle-state obtaining apparatus comprising:

a remote detecting device (10-16; 10b-16b; 200-206; 300-306; 400a-400d; 500) including a first detecting device (32; 212; 312; 412; 504), and a transmitting device (36; 36b; 216; 316; 416; 506) operable to transmit, in a wireless fashion, first-detecting-device information including information indicative of an output of said first detecting device; and

an information processing device (18; 18b; 230; 330; 404; 520) including (a) a remote-information obtaining device (20-26, 52; 20b-26b, 52; 240-246, 252; 332-338, 352; 402; 514) including a receiving device (20-26; 20b-26b; 240-246; 332-338; 419a-419d; 510) operable to receive said first-detecting-device information transmitted in a wireless fashion from said remote detecting device, said remote-information obtaining device being operable to obtain remote information representative of a state of the vehicle, on the basis of said first-detecting-device information received by said receiving device, (b) a wire-transmission-dependent-information obtaining device (60-69, 54; 60-69, 254; 354, 360-364; 404; 520) including a second detecting device (60-66; 360-364; 420; 516) and operable to obtain wire-transmission-dependent information representative of said state of the vehicle, on the basis of second-detecting-device information which has been transmitted from said second detecting device through a signal line (69; 422) and which includes information indicative of an output of said second detecting device, and (c) an information determining device (55; 255; 355; 428; 522) operable to determine one of said wire-transmission-dependent information and said remote information, as vehicle-state information representative of said state of the vehicle,

and wherein said wire-transmission-dependent-information obtaining device (60-69; 54; 60-69, 254; 354, 360-364;

404; 520) is operable to obtain said wire-transmission-dependent information, during a period between adjacent moments of reception of said first-detecting-device information by said remote-information receiving device, said information determining device being operable to determine, as said vehicle-state information, said wire-transmission-dependent information obtained during said period.

42. A vehicle-state obtaining apparatus according to claim 41,

wherein said first detecting device is operable to detect one state of said vehicle as said state of the vehicle, while said second detecting device is operable to detect another state of the vehicle which is different from said one state, and said wire-transmission-dependent-information obtaining device includes an estimating portion (54; 254; 354; 426; 518) operable to estimate said one state of the vehicle on the basis of said another state of the vehicle detected by said second detecting device.

43. A vehicle state obtaining apparatus according to claim 41 or 42, wherein said remote detecting device is provided on a sprung member of the vehicle, while said information processing device is provided on an unsprung member of the vehicle.

44. A vehicle-state obtaining apparatus according to any one of claims 41-43, wherein said remote detecting device is provided on a wheel of the vehicle.

45. A vehicle-state obtaining apparatus according to any one of claims 41-44, wherein said information determining device is operable to determine said wire-transmission-dependent information as said vehicle-state information, when said remote information has not been received by said remote-information obtaining device.

46. (Amended) A vehicle-state indicating apparatus comprising:

a wheel-state obtaining apparatus as defined in any one of claims 1-39;

a judging device (56; 256; 356) operable to determine whether said first state of said corresponding wheel is normal or not; and

an indicator device (70; 430; 524) operable, when said judging device determines that said first state of said corresponding wheel is not normal, to provide an indication that said first state is not normal.

47. (Amended) A vehicle-state control apparatus comprising:

a wheel-state obtaining apparatus as defined in any one of claims 1-39;

an actuator portion (104; 122) operable to control a state of the vehicle; and

an actuator control portion (106; 124) operable to control said actuator portion on the basis of said first state of said corresponding wheel obtained by said wheel-state obtaining apparatus.

48. (Amended) A wheel-state control apparatus comprising:

a wheel-state obtaining apparatus as defined in any one of claims 1-39;

an actuator portion (104; 122) operable to control said first state of said corresponding wheel; and

an actuator control portion (106; 124) operable to control said actuator portion such that said first state of said corresponding wheel obtained by said wheel-state obtaining apparatus is held within a predetermined range.